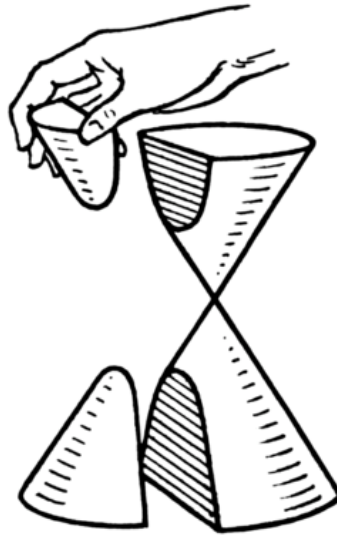


Hyperbolas



Hyperbola centered at (0, 0)

HORIZONTAL

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

asymptotes at $y = \pm \frac{b}{a}x$ co-vertices $(0, \pm b)$

vertices $(\pm a, 0)$; foci $(\pm c, 0)$

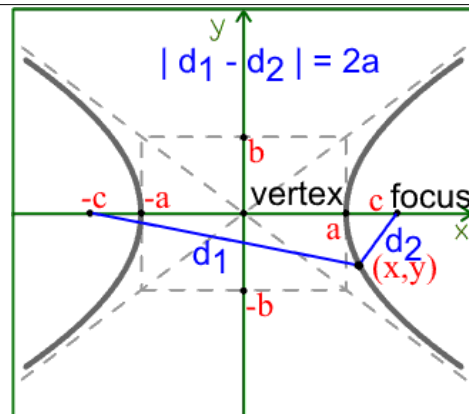
VERTICAL

$$\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$$

asymptotes at $y = \pm \frac{a}{b}x$

vertices $(0, \pm a)$; foci $(0, \pm c)$

$c^2 = a^2 + b^2$ co-vertices $(\pm b, 0)$



$$\frac{y^2}{169} - \frac{x^2}{144} = 1$$

$$a=13 \quad b=12$$

$$c^2 = 169 + 144$$

$$c^2 = 313$$

$$c = \sqrt{313}$$

asymptotes $y = \pm \frac{13}{12}x$

vertices $(0, \pm 13)$

co-vertices $(\pm 12, 0)$

foci $(0, \pm \sqrt{313})$

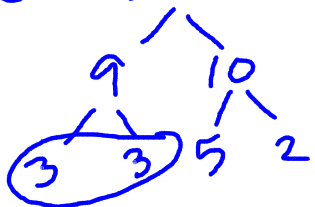
$$\frac{x^2}{9} - \frac{y^2}{81} = 1$$

$$a=3 \quad b=9$$

$$c^2 = 9 + 81$$

$$c^2 = 90$$

$$c = \sqrt{90} = 3\sqrt{10}$$



asymptotes $y = \pm 3x$

vertices $(\pm 3, 0)$

co $(0, \pm 9)$

foci $(\pm 3\sqrt{10}, 0)$